Wetwood

Watersoaked, discolored, and often smelly wood in living trees

Cause—Wetwood is not a disease. It results from a physiological process that occurs when the living cells in the wood die. Although it is sometimes called "bacterial" wetwood, this is a misnomer because it is not caused by bacteria. However, various bacteria colonize wetwood and, in some cases, cause additional damaging effects.

For many years, wetwood was thought to be a bacterial disease. However, later experiments showed that wetwood can be formed following wounding under conditions that preclude bacterial growth. During death of the parenchyma in wood, calcium, potassium, and magnesium salts are mobilized into the area, lowering the osmotic potential. Moisture accumulates in response to the osmotic gradient, and a drier transition zone with living parenchyma separates sapwood from wetwood.

Hosts—Wetwood occurs in many hardwoods and in some conifers. In this Region, wetwood often occurs in elm, maple, ash, cottonwood, aspen, and white fir.

Signs and Symptoms—Wetwood is wood that does not conduct water but has a watersoaked, dark appearance (figs. 1-3) and a fetid, fermentative odor. It is the normal condition of the heartwood in some species but may occur uncommonly in others. It may also appear in sapwood in response to wounds or biological attacks.

Because of bacterial fermentation, the wetwood liquid may be under pressure. In some areas where white fir is harvested, squirting of the foul liquid under pressure onto loggers has led to the appellation "piss-fir." Externally, especially in elm, the fermented liquid may be exuded through cracks or branch stubs, leaving streaks of bleached or discolored bark (figs.4-5). The exudate is often colonized by additional micro-organisms when it reaches the surface, leading to a thickened consistency and additional odors. Such liquid is called wetwood slime and the condition is called slime flux.

Figure 1. Wetwood in cross section of narrowleaf cottonwood. *Photo: Jim Worrall, USDA Forest Service.*

Figure 2. Wetwood in cross section of white fir. *Photo: Jim Worrall, USDA Forest Service.*

Impact—Wetwood inhibits wood-decay fungi. Wood that is wet has very low O2 availability, and the bacteria present in wetwood further reduce the O2 content to a level too low to support fungal growth. Bacteria also produce organic acids that strongly inhibit fungal growth. Thus, the bacteria generally seem to function more as beneficial symbionts, aiding the tree's defense, rather than as pathogens.

In some species, most notably elm, wetwood fluid may develop pressure due to gasses produced by the bacteria. When this happens, the liquid may be

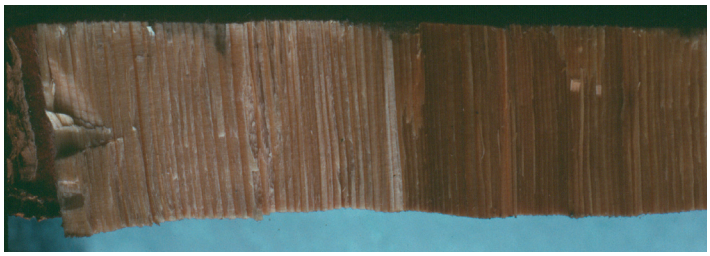

Figure 3. Wetwood in radial section of white fir. Note the narrow, dry transition zone between sapwood on left and wetwood. *Photo: Jim Worrall, USDA Forest Service.*

forced into and kill adjacent sapwood and cambium. In severe cases foliar symptoms may result, including scorch, wilt, yellowing, and defoliation. The fermented liquid may seep out through branch stubs and cracks and discolor the bark surface as it flows down.

Wetwood is associated with a variety of problems when making wood products:

Wood is more difficult and requires more energy to dry.

Wood dries unevenly and may warp and twist.

During kiln drying, vapors of the volatile organic acids (acetic, propionic, butyric) cause kiln corrosion.

Wetwood is associated with ring shake and honeycomb, two lumber defects. Ring shake in elm has led to the term "onion elm" in the lumber trade.

Figure 4. Bark bleaching and discoloration from wetwood fluid flowing from branch stub in elm. *Photo: William Jacobi, Colorado State University, Bugwood.org.*

Figure 5. Bark bleaching and discoloration from wetwood fluid flowing from crack in elm. *Photo: Mike Schomaker, Colorado State Forest Service, Bugwood.org.*

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